REMARKS

In complete response to the outstanding Official Action of June 23, 2003, on the above-identified application, reconsideration is respectfully requested. Claims 1-26 are pending in the application. Claims 1-26 are rejected. Claims 1 and 17 have been amended.

Claim Rejections Under 35 U.S.C. § 102:

Claims 1-3, 9, 11, 12, 14, 16, 17-19, 22-26 are rejected under 35 U.S.C. § 102 (b) as being anticipated by Plumat (US Patent 2,838,881).

The Examiner notes that:

"Plumat teaches a method for making glass beads by firing an air fuel burner in a shaft furnace to thereby drawing air into the shaft; adding raw material to the furnace; and adding oxidant via a single lance, multiple lances,..."

The Examiner further notes that:

"Plumat teaches adding air as the oxidant (col. 5, lines 18-21). This satisfies applicant's definition of oxidant given on page 5, paragraph 0025 which states that oxidant includes non-pure oxygen which includes oxidants having an oxygen content greater than 21%, because air has a weight percent of 23% oxygen."

Applicants respectfully contend that the present invention is not anticipated by Plumat (US Patent 2,838,881).

Plumat (US Patent 2,838,881) discloses a process for the **pr h ating of glass granules** with great rapidity up to a temperature slightly below the softening temperature of the glass by **dispersing the granules** in an air stream already preheated to a temperature slightly above the softening glass.

Plumat (US Patent 2,838,881) further discloses the **rapid melting and solidification of formed beads** to ensure that a high proportion of the glass granules gets melted and that a high proportion of formed beads are not joined and sticking together and therefore cannot be used (column 1, lines 44-72).

In contrast, the present invention claims a process and apparatus for **improving** the **production capacity** of **spheroidal glass particles** of a vertical glass furnace while retaining the glass bead quality. This **glass quality** is directly **proportional** to the **volume of combustion gas** and the **production** capacity is also directly **proportional** to the **flame gas temperature** (page 3, paragraphs 0008 and 0009). This improvement in both capacity and quality is accomplished by introducing an **oxidant or oxygen jet** at a very **high velocity** into the bottom opening of the vertical glass furnace. This high velocity oxidant or oxygen causes an ejector effect and thereby **entrains a very large amount of ambient air**, specifically up to 100 to 300 times in volume of the injected oxygen-rich gas (and thereby improving quality).

The oxygen-enriched gas mixes with the air-gas burner combustibles to create flame gases at slightly higher temperatures. This **increase** in air flame **temperatur** and additional **entrainment** of ambient air (from the bottom

opening of the furnace) creates a **fast r** and **improved spheroidization process,** respectively (page 4, paragraph 0027).

The terms "oxidant" and "oxygen" include oxygen-enriched air and oxygen-enriched gases where oxygen content exceeds 21 mol %, i.e., it exceeds 23.3 weight% (page 5, paragraph 0025).

Hence, the present invention as claimed in Claims 1-3, 9,11,12,14,16, 17-19, 22-26 is not anticipated by Plumat (US Patent 2,838,881).

Claims 17-18, 22, 25-26 are rejected under 35 U.S.C.102 (b) as being anticipated by Palmer (US Patent 2,958,161).

Applicants respectfully contend that the present invention is not anticipated by Palmer (US Patent 2,958,161).

The Examiner notes that:

> "Palmer teaches a vertical glass furnace having a shaft with an interior space open at the bottom; an air fuel burner; and an oxidant addition including a single lance, multiple lances and an oxidant ring..."

Palmer (US Patent 2,958,161) discloses a method for **melting glass-making ingredients** in pellet or granular forms **into glass** in a melting furnace.

In contrast, the present invention claims a method/apparatus for the **production of spheroidal glass particles** in a vertical glass furnace.

Palmer (US Patent 2,958,161) further discloses an operating **pr ssure** of the melting section in the range of about **15 psig or high r** in order to **attain a**

high thermal efficiency (column 4 lines 66-72). Additionally, the glass-melting furnace is equipped with a spout for discharging the molten glass into a suitable holding furnace (column 4, lines 4-6).

In contrast, the present invention claims an operating **pressure** of the vertical glass furnace is **sub-atmospheric** in order to **entrain air into the furnace shaft** through the open bottom of the furnace. Thus, the **two furnaces** are **completely different in both construction and function**.

Hence, the present invention as claimed in Claims 17-18, 22, 25-26 is not anticipated by Palmer (US Patent 2,958,161).

Claim Rejection Under 35 U.S.C. § 103

Claim 4 is rejected under 35 U.S.C. § 103 (a) as being unpatentable over Plumat (US Patent 2,838,881) and in further view of Potter (US Patent 2,619,776).

The Examiner notes:

> "It would have been prima facie obvious at the time the invention was made to combine Potter's equivalence ratio with Plumat's method of making glass beads because doing so would prevent carbon formation which would coat/contaminate the beads producing an undesirable product."

Potter discloses a method and apparatus for **regulating the flame** of the **gas burn r** to provide **compl te combustion** within the draft tube with no carbon formation and to yet to **prevent an excess of air** (column 3, lines 56-59).

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2,838,881) and in further view of Potter (US Patent 2, 619, 776).

The present invention claims that an air-fuel burner flame stoichiometry (equivalence ratio) is adjusted between about 0.7 and about 1.00 (i.e. fuel rich) and the remaining oxidant for combustion is supplied through the oxygen lance and entrained ambient air from the bottom of the furnace (page 12, paragraph 0046).

The **rich-firing primary combustion** generates a large amount of carbon monoxide, unburnt fuel, soot and other hydrocarbons. The subsequent combustion (**secondary combustion**) of these products using the injected oxidant and entrained ambient air **creates** a very **luminous flame**. The visible flame radiation provides more **uniform heat transfer** to the glass particles **without creating hot spots** (page 7, paragraph 0031).

It is very apparent that **Potter** discloses a **one-phase combustion process** (i.e., one primary combustion) whereas the **present invention** claims a **two-phase combustion process** (i.e., a primary combustion and a secondary combustion).

Hence, one of ordinary skill in the art would not find that Plumat (US Patent 2,838,881) and in further view of Potter (US Patent 2,619,776) as claimed in Claim 4 either teaches or suggests the present invention.

Claims 5, 10,13, and 15 are rejected under 35 USC 103 (a) as being unpatentable over Plumat (US Patent 2,838,881).

The Examiner notes that:

"It would have been prima facie obvious at the time the invention was made to use the claimed velocities for the oxidant with Plumat's method of making glass beads because Plumat teaches that it is known to control the velocity to achieve the desired bead suspension and solidification."

Plumat (US Patent 2,838,881) discloses an apparatus for projecting the glass granules by an airjet with a velocity sufficiently high for reaching a predetermined height so that the granules are taken up in the homogenized vapor current and carried upwardly and thereby ensuring that granules may not drop down to the lower part of the column (column 5, lines 65-70).

Plumat (US Patent 2,838,881) further discloses that by **regulating** the **velocity and temperature** of the air, optimum conditions for carrying out the process of **infusion and solidification** can be attained (column 6, lines 13-17).

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2,838,881).

The present invention claims a process/apparatus for the introduction of an **oxidant or oxygen jet** at very **high velocity** to cause an ejector effect and thereby entrain a very large amount of ambient air in order to **improve** the **quality of formed beads** (page 6, paragraph 0027).

Furthermore, Plumat (US Patent 2,838,881) **does not xplicitly teach** the claimed **air velocities**, whereas the **present invention claims oxidant velocities** for single-lance and multiple lance, lance incorporated into the air fuel burner and injection ring systems.

Claims 6-8, 20-21 are rejected under 35 USC 103 (a) as being unpatentable over Plumat (US Patent 2838881) and in further view of Brahmbhatt et al. (US Patent 5,611,833).

The Examiner notes:

"It would have been prima facie obvious at the time the invention was made to combine Brahmbhatt et al.'s oxyfuel burner and stoichiometry with Plumat's method of and apparatus for making glass beads because doing so would permit the beads to be manufactured at a much quicker pace and would reduce the chance for contamination due to carbon formation because the oxy-fuel burner burns more cleanly and hotter than its air fuel counterpart."

Applicants respectfully contend that the present invention is not unpatentable over Plumat (US Patent 2838881) and in further view of Brahmbhatt et al. (US Patent 5,611,833).

Brahmbhatt et al. (US Patent 5,611,833) discloses a method/apparatus for **entraining a powder of glass particles** in an inert carrier gas and injecting the entrained particles into the center of the flame of an oxygen fuel burner (Abstract).

Brahmbhatt et al. (US Patent 5,611,833) also discloses that fuel and substantially **pure oxygen** with the correct stoichiometric ratio are introduced into the burner to **support combustion**. It further discloses that the residence time (the length of time that particles reside in the flame) can be regulated the pressure of the carrier gas. The heat of the flame causes the particles to become **spherical or spheroidal** while still maintaining their **original sizes,** i.e., it does not form into glass beads of very small sizes (column 4, lines 5-8).

The present invention is uniquely different in that: it **does not use an inert carrier gas**. **Combustion** is carried out in a **two-phase** (primary combustion step and secondary combustion step). It utilizes an oxygen-enriched gas and not a substantially **pure oxygen**. The furnace operates at an ambient pressure. The softened glass beads in the high temperature flame zone react and due to surface tension form into glass spheres of very small sizes ranging from 10 to 50 microns.

Hence, one of ordinary skill in the art would not find that Plumat (US Patent 2,838,881) and in further view of Brahmbhatt et al. (US Patent 5,611,833) as claimed in Claims 6-8 and 20-21 either teaches or suggests the present invention.

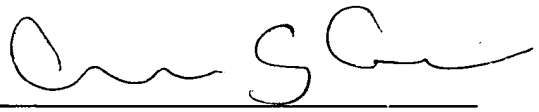
Claim Objections

Per the Examiner's request, Applicants have amended Claim 17, line 3, so that it now reads as follows: a raw material addition device mounted to add raw material to the interior of the shaft.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the examiner believe a telephone call would expedite the prosecution of the application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,



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